

NEPP DC/DC Converter & Hybrid Working Group

June 17, 2014

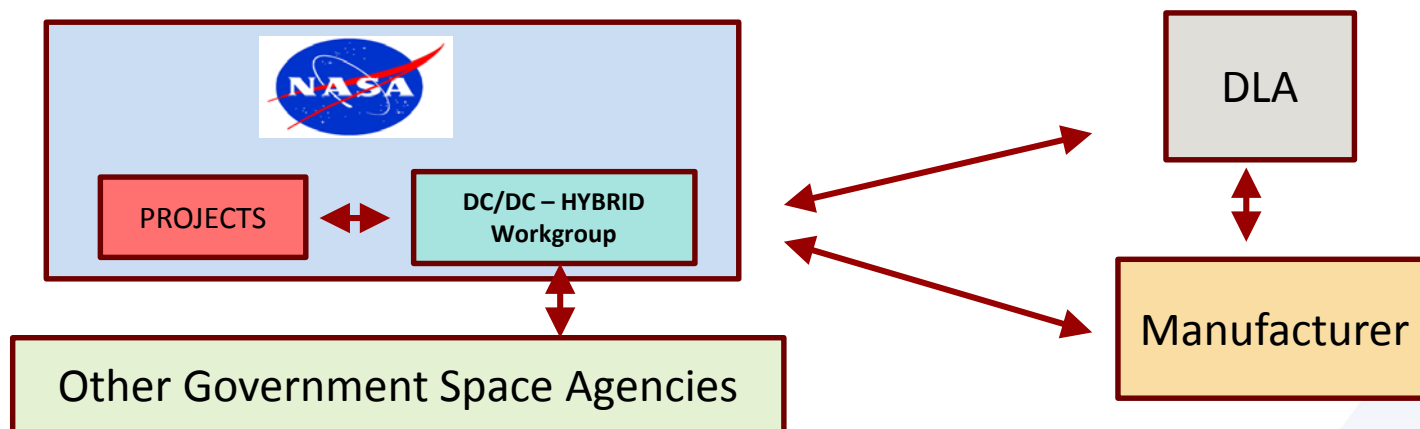


Key Points



- **Mission:** To communicate information on key issues regarding the reliability of Hybrid Microcircuits & DC/DC Converters with specific emphasis on manufacturing, specifications & procurement.
- **Monthly Teleconferences**
 - First Wednesday of every month @ 1:00p.m. EST
 - Usual Attendees: NASA Centers, Aerospace Corporation, NAVSEA & DLA(L&M)

ORGANIZATIONAL INTERFACES

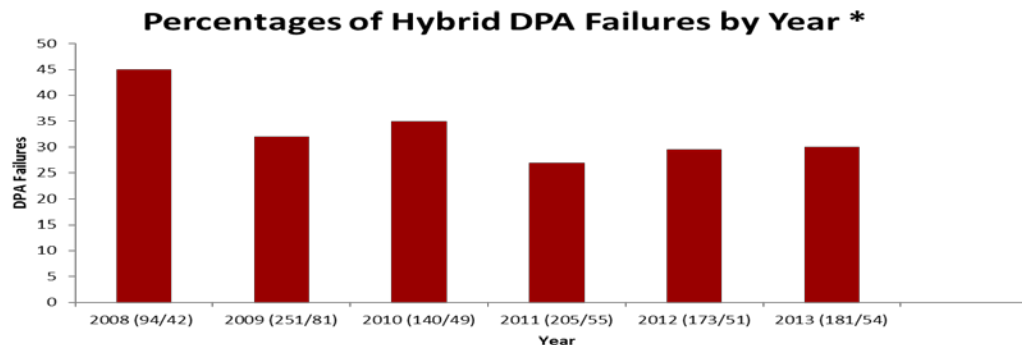




Motivation



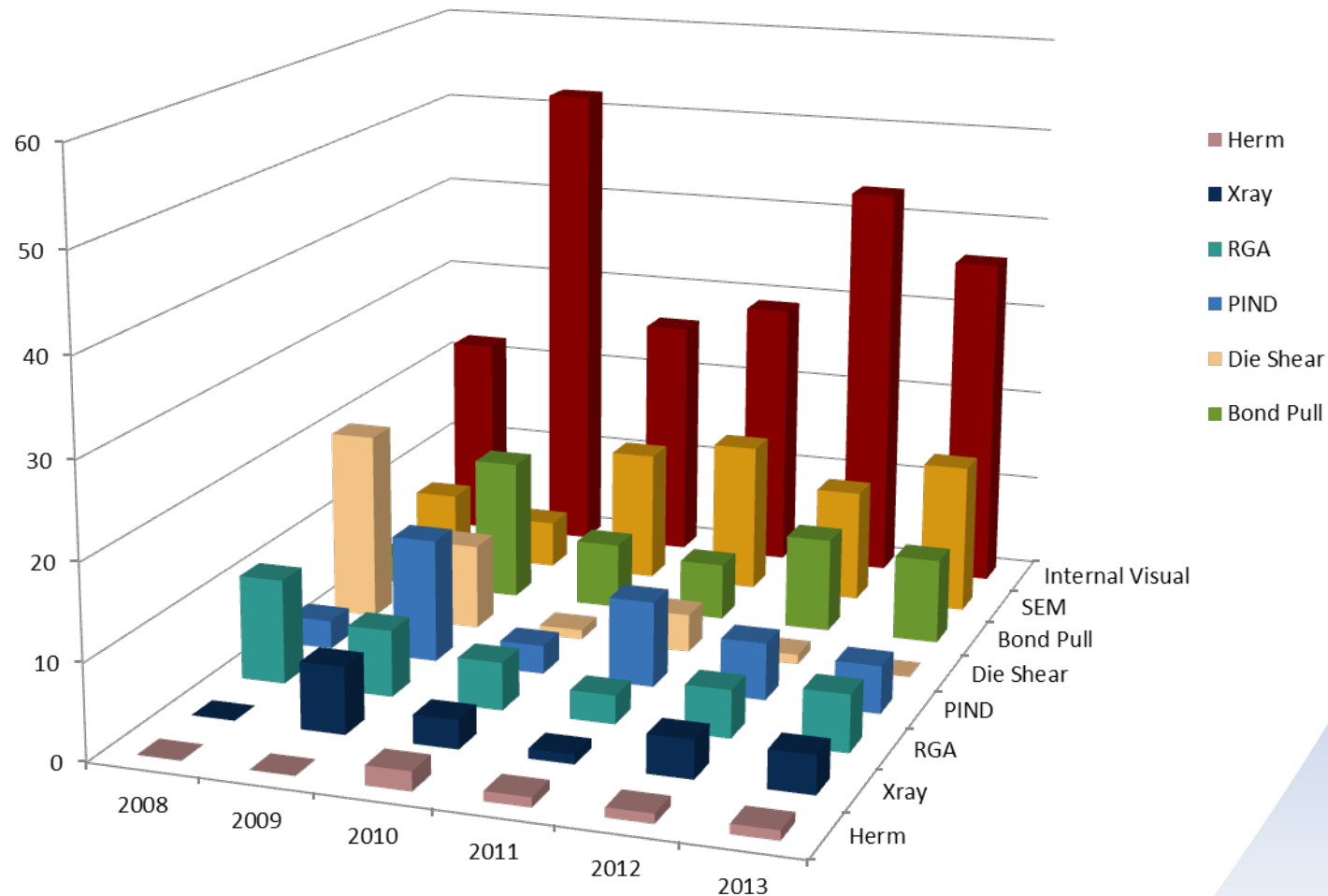
- **Switch Mode Power Supplies (DC/DC Converters)**
 - Enormously Complex due to Extreme Miniaturization
 - Paramount Programmatic Penalties [Budget, Time]
 - Manufacturing challenges
 - Assembling hundreds of components using various techniques in a hermetic package (typically $1\text{in}^2 - 5\text{in}^2$)
 - Low production numbers
 - High reliability in extreme environments [verified by sampling & screening]



* Data compiled from Hi-Rel Laboratories at Space Parts Working Group Conference presentation (2009-2014)



Classification of DPA Failure Causes *



* Data compiled from Hi-Rel Laboratories presentations at Space Parts Working Group Conference (2009-2014)

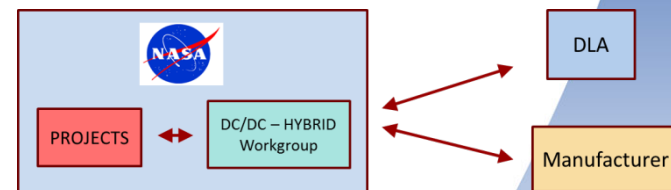


Key Points



General Topics

- Sharing of data on purchases, requirements, specifications (SMDs vs. SCDs)
 - Customizations by Centers and Product Performance Issues
 - Discussions on Failure Mechanisms, purchase lead time and delay issues
- Sharing of information on failures, delays, GIDEPs, vendor notifications, etc.
- Updates from Defense Logistics Agency
 - Audit reviews
 - Moves, Consolidations, New ownership
 - Alternate Methods
- Review / revising of current Military Specifications
- Attendance at JEDEC / G-12 Conferences (JC-13* Government Liaison)
 - Attend 13.5 Hybrid Working Group Meetings



* JC-13 is responsible for standardizing quality and reliability methodologies for solid state products used in military, space, and other environments requiring special-use condition capabilities beyond standard commercial practices. This includes long-term reliability and/or special screening requirements.



Current & Future Actions



➤ Audits

- 11 Class H & K Hybrid Audits since last year [NASA Representation]
 - Under review during typical audit
 - Review of any current issues
 - Design Analysis: Derating / Stress
 - Failure Analysis (Customer returns)
 - Testing
 - Traceability
 - Organizational QA Program
 - Reports available on NASA SAS website

➤ Military Specifications

- MIL-STD-883 TM 2017 (Internal Visual Inspections – Hybrids)
- MIL-STD-883 TM 2009 (External Visual Inspections)
- Gen Spec for Hybrids (MIL-PRF-38534)
 - Draft of Rev J expected this fall



Conclusions



➤ Hybrids are considered “High Risk”

➤ Mitigation

- Fostering communication among Government Space Agencies, Manufacturers and DLA
 - Need involvement from all NASA Centers!
- Appropriate level of requirements (Procurement)
 - Class H, K, E... (using the Mil-Spec System)
 - Add testing
 - Lot specific life test
 - PreCap Inspections
 - Traveler / Test Data Review
- Appropriate level specifications
 - What do we want to make standard practice?
 - What gives up the most value with modern budgets/schedules?



QUESTIONS / FEEDBACK